> piezoelectric actuator stacks 254 and 256. The voltage waveform cooperates with piezoelectric actuator stacks 254 and 256 to separate prism arrays 250 and 252 by different distances so as to shift color component dots into alignment to get the desired R, G, B superposition.

Applicants request, therefore, that the objection to the drawings with regard to claim 11 be withdrawn.

With regard to claim 13, Fig. 7 shows "a color separating element for providing the color separation of incident multi-color illumination light and a prism array positioned after the color separating element." As stated in paragraph 65:

> Figs. 6 and 7 are optical schematic illustrations of alternative implementations of this invention in which grating 16 of dot sequential color display system 10 is replaced with an angular color separation system 90 of the type described in US Pat. No. 5,161,042 of Hamada. The implementation of Fig. 7 further includes a prism array 92 that functions as a total internal reflection (TIR) 'deflector' that receives normal incident light and deflects or angles the light to some desired direction so as to be appropriate for the next stage.

Applicants request, therefore, that the objection to the drawings with regard to claim 13 be withdrawn.

With regard to claim 18, Fig. 23 shows "the each microlens is aligned with and delivers light to a triplet of color-component sub-pixels that are positioned among two adjacent horizontal rows." Claim 18 has been amended to correct the duplicate phrase "that are arranged." As stated in paragraph 95:

> Fig. 24 is a diagrammatic illustration of an alternative color mosaic arrangement 310 of sub-pixels 312 in a display device (e.g., LCD). Color mosaic arrangement 310 positions sub-pixels 312 in another dense, closer-packed arrangement that differs from arrangement 300 in that the former includes one sub-pixel 312' (e.g., a center pixel, illustrated as receiving green light) that is offset from alignment with the other two sub-pixels 312.

Applicants request, therefore, that the objection to the drawings with regard to claim 18 be withdrawn.

With regard to claim 29, Fig. 18 shows the dynamic displacement element having a pair of face-to-face refractive elements. As stated at paragraph 85:

> Figs. 18-22 are diagrammatic illustrations of dynamic post-display pixel element alignment systems or "wobblers." Fig. 18 shows two prism arrays 250 and 252 with two piezoelectric actuator stacks 254 and 256 and a voltage waveform that is applied to piezoelectric actuator stacks 254 and 256. The voltage waveform cooperates with piezoelectric actuator stacks 254 and 256 to separate prism arrays 250 and 252 by different distances so as to shift color component dots into alignment to get the desired R, G, B superposition.

Applicants request, therefore, that the objection to the drawings with regard to claim 29 be withdrawn.

With regard to claim 34, the claim has been amended to recite a step of angularly color separating incident multi-color illumination light to provide the color-separated, fixed color components. Figs. 6 and 7 show the step of angularly color separating incident multi-color illumination. As stated in paragraph 65:

> Figs. 6 and 7 are optical schematic illustrations of alternative implementations of this invention in which grating 16 of dot sequential color display system 10 is replaced with an angular color separation system 90 of the type described in US Pat. No. 5,161,042 of Hamada.

Applicants request, therefore, that the objection to the drawings with regard to claim 34 be withdrawn.

With regard to claim 37, Figs. 23 and 24 show respective color mosaic arrangements 300 and 310 that positions sub-pixels in denser, closer-packed arrangements with packed vertical columns of red, green, and blue color component sub-pixels. Fig. 23 also shows as modulation 308 "dynamically aligning the color-component sub-pixels after the display element includes displacing selected color components laterally." As stated with reference to Fig. 23 in paragraph 91:

> As a result, the microlenses 306 at the display device (e.g., LCD) turn the horizontal angular separation of color into LCD pixel separation. Linear (e.g., horizontal) dot sequential modulation 308 displaces light horizontally during three successive times in each frame to provide a complete display image in accordance with the present invention.

Applicants request, therefore, that the objection to the drawings with regard to claim 37 be withdrawn.

With regard to claim 38, Fig. 24 shows that "the color-component sub-pixels of a pixel are arranged on the displav panel in adjacent rows and dynamically aligning the color-component sub-pixels after the display element includes displacing selected color components in transverse directions." As stated in paragraph 92:

> Fig. 24 is a diagrammatic illustration of an alternative color mosaic arrangement 310 of sub-pixels 312 in a display device (e.g., LCD). Color mosaic arrangement 310 positions sub-pixels 312 in another dense, closer-packed arrangement that differs from arrangement 300 in that the former includes one sub-pixel 312' (e.g., a center pixel, illustrated as receiving green light) that is offset from alignment with the other two sub-pixels 312.

For example, the blue and red color component sub-pixels are positioned in one row, and the green color component sub-pixel is positioned in an adjacent row. "Displacing selected color components in transverse directions" is shown in Fig. 24 as modulation 318, which is referenced in paragraph 93 as follows:

> Triangular or circular dot sequential modulation 318 displaces light during three successive times during each frame to provide a complete display image in accordance with the present invention.

Applicants request, therefore, that the objection to the drawings with regard to claim 38 be withdrawn.

With regard to claim 39, Fig. 14 shows ""a color display system with plural pixellated electronic display panels that each receive illumination of a different color component of light and a combiner that combines color component light images formed by the display panels, the improvement comprising: a post-combiner dynamic displacement element that displaces alignment of the color-component sub-pixels generated by the display panel to form a resolution - enhanced display image"." As stated with reference to Fig. 14 in paragraph 91:

> Fig. 14 is an optical schematic illustration of a resolution enhancing dot sequential color display system 200 according to the present invention. Dot sequential color display system 200 illustrates a

> conventional three-panel color projector configuration that further includes a "dot-shifter," such as a dynamically tilted plate 202, which is tilted at a fast field rate to form a four-frame sequence. For example, dot sequential color display system 200 includes a pair of color separating dichroic mirrors 204 and 206 that reflect respective blue and green light and transmit other light. Fold mirrors 208, 210, and 212 redirect the color separated light components toward monochrome display devices (e.g., LCDs) 214, 216, and 218. An X-cube prism combination 220 combines the color component images, which pass through dynamically tilted plate or wobbler 202 to a projection lens assembly 222.

Applicants request, therefore, that the objection to the drawings with regard to claim 39 be withdrawn.

For the foregoing reasons, applicants request that the objections to the drawings under 37 CFR 1.83(a) be withdrawn.

Claims 1-14 are objected to under 37 CFR 1.75 as being a substantial duplicate of claims 19-32. The Examiner deems "a color display system" of claims 1-14 (Group I) to be the same thing as the "color electronic display projector" of claims 19-32 (Group II). Applicants traverse this objection for the following reasons.

The Examiner is obliged to give due consideration to every word in a claim. MPEP 2111.02 further states that any terminology in the preamble that limits the structure of the claimed invention must be treated as a claim limitation. Applicants submit that the Examiner is improperly failing to give due consideration to the preambles of the claims of Groups I and II.

Applicants submit that a "color display system" as recited in Group I is not the same as a "color electronic display projector" as recited in Group II. A "Color display system" can encompass electronic display projectors, as well as other displays such as direct view displays, but not all "color display systems" are "color electronic display projectors". The difference between the claims of Groups I and II is not "a slight difference in wording," but rather references distinct segments of display applications.

One test for identity between claims, in the context of double patenting, requires that the Examiner to ask whether there is an embodiment of the invention that falls within the scope of one claim, but not the other. If there is such an embodiment, then the claims are not identical. With regard to the claims of Groups I and II, applicants have already clarified that there are color display systems, such as direct-view displays, that would not be deemed "color electronic display projectors." This example alone shows that the claims of Groups I and II are not identical duplicates and the objection under 37 CFR 1.75 is improper and should be withdrawn.

Claims 10-11, 28-29, 33 and 39 are rejected under 35 U.S.C.112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner identifies various claim elements as lacking antecedent bases. Applicants respond as follows.

Claims 9 and 10 have been amended to depended from claim 8, which provides an antecedent basis for "the rotating element includes a plural refractive." Likewise, claims 27 and 28 have been amended to depend from claim 26.

Claims 11 and 29 have been amended to recite a "post-display panel dynamic displacement element" to conform literally to the "post-display panel dynamic displacement element" recited in respective claims 1 and 19.

In claim 33, "display element" has been amended to "display panel" for which an antecedent basis is provided.

Claim 39 has been amended to recited "plural pixellated electronic display panels" to conform literally to the plural pixellated electronic display panels for which there is antecedent basis.

Claims 33 and 34 are rejected under 35 U.S.C.112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements. With regard to claim 33, the Examiner states that the element for

"dvnamically aligning the color-component sub-pixels " is omitted. Applicants note that claim 33 is a method claim, which is a claim format that is allowed under 35 USC 101 and that is directed to functional operations rather than structural elements. The claim element objected to by the Examiner is simply a functional step: dynamically aligning the color-component sub-pixels. No "structural cooperative relationships" are required in this method claim. Applicants submit, therefore, that claim 33 is of a proper method claim form and that no essential structural element is omitted.

With regard to claim 34, the Examiner states that the omitted structural cooperative relationship is "an angularlv color separating incident multi-color illumination light." Applicants note that claim 34 is a method claim, which is a claim format that is allowed under 35 USC 101 and that is directed to functional operations rather than structural elements. The claim element objected to by the Examiner is simply a functional step: angularly color separating incident multi-color illumination light. No "structural cooperative relationships" are required in this method claim. Applicants submit, therefore, that claim 34 is of a proper method claim form and that no essential structural element is omitted.

Claim 37 is rejected under 35 U.S.C.112, second paragraph, for indefiniteness. The Examiner fails to understand the process of "after the display element includes displacing selected color components laterally," and adds that "structure cooperative relationships" (sic) are omitted. Applicants respond as follows.

Claim 37 recites two features. (1) The display panel includes color-component sub-pixels that are arranged in vertical columns for each color component. (2) Dynamically aligning the color-component sub-pixels after the display panel (as recited in claim 33) includes displacing selected color components laterally. Applicants believe the Examiner has incorrectly parsed the terms "after the display panel" in the second feature from the terms in the first feature that should be modified – "dynamically aligning the color-component sub-pixels." These two passages, when read together as in claim 33, mean that after

the display, the color-component sub-pixels are dynamically aligned. Claim 37 then adds that this dynamic alignment includes "displacing selected color components laterally."

The elements supporting claim 37 are shown in application Fig. 23: color-component sub-pixels that are arranged in vertical columns and lateral or horizontal displacement 308. These features are recited in the context of a method claim, which is a claim format that is allowed under 35 USC 101 and that is directed to functional operations rather than structural elements. The claim element objected to by the Examiner is simply a functional step: displacing selected color components laterally. No "structural cooperative relationships" are required in this method claim. Applicants submit, therefore, that claim 37 is of a proper method claim form and that no essential structural element is omitted.

Claim 38 is rejected under 35 U.S.C.112, second paragraph, for indefiniteness. The Examiner fails to understand the process of " after the display element includes displacing selected color components in transverse directions," and adds that "structure cooperative relationships" (sic) are omitted. Applicants respond as follows.

Claim 38 recites two features. (1) The color-component sub-pixels of a pixel are arranged on the display panel in adjacent rows. (2) Dynamically aligning the color-component sub-pixels after the display panel (as recited in claim 33) includes displacing selected color components in transverse directions. Applicants believe the Examiner has incorrectly parsed the terms "after the display panel" in the second feature from the terms in the first feature that should be modified– "dynamically aligning the color-component sub-pixels." These two passages, when read together as in claim 33, mean that after the display, the color-component sub-pixels are dynamically aligned. Claim 37 then adds that this dynamic alignment includes "displacing selected color components in transverse directions."

The elements supporting claim 38 are shown in application Fig. 24: color-component sub-pixels that are arranged in adjacent rows and transverse

displacement 318. These features are recited in the context of a method claim, which is a claim format that is allowed under 35 USC 101 and that is directed to functional operations rather than structural elements. The claim element objected to by the Examiner is simply a functional step: displacing selected color components laterally. No "structural cooperative relationships" are required in this method claim. Applicants submit, therefore, that claim 38 is of a proper method claim form and that no essential structural element is omitted.

Claim 39 is rejected under 35 U.S.C.112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements. The Examiner cites as the omitted element the exact features that are recited in the claim. Applicants believe the rejection is improper for citing as omitted features the very features that are recited in the claim. Moreover, applicants note that features of claim 39 are illustrated in Fig. 14, including a color display system with plural pixelated electronic display panels. Applicants submit therefore that the amendment proposed by the Examiner is unnecessary and erroneous and request, therefore, that this rejection be withdrawn.

Claims 1-3, 13-18, 19-21 and 31-32 are rejected under 35 U.S.C.102(b) as being anticipated by Loiseaux et al. (US5467206A). In regard to claims 1-3,15-18 and 19-21, Loiseaux et al. (Figs. 8 and 5b) is cited as showing various features, including a post-display panel dynamic displacement element (field lens) that displaces alignment of the color-component sub-pixels SR/SB/SG generated by the display panel (as shown in Fig. 1). Applicants respond as follows.

Claims 1-3 and 15-18 each include "a post-display panel dynamic displacement element that displaces alignment of the color-component sub-pixels generated by the display panel." The dynamic displacement element is positioned "post-display panel" and functions to displace alignment of the color-component sub-pixels generated by the display panel.

Every word in a claim must be given its due weight and meaning. The recited displacement element is "dynamic." Dynamic means "of or relating to

energy or to objects in motion." Various dynamic displacement elements are shown and described in the application, including those of Figs. 18-22. In the rejection of claims 1-3 and 15-18, the Examiner cites a static, motionless, fixed field lens in Loiseaux et al. Applicants submit that the static, motionless, fixed field lens in Loiseaux et al. fails to teach or suggest the dynamic displacement element recited in claims 1-3 and 15-18. Applicants submit that the rejection of claims 1-3 and 15-18 is therefore improper and request that it be withdrawn.

Claims 19-21 each include "a post-display panel dynamic displacement element that displaces alignment of the color-component sub-pixels generated by the display panel." The dynamic displacement element is positioned "post-display panel" and functions to displace alignment of the color-component sub-pixels generated by the display panel.

Every word in a claim must be given its due weight and meaning. The recited displacement element is "dynamic." Dynamic means "of or relating to energy or to objects in motion." Various dynamic displacement elements are shown and described in the application, including those of Figs. 18-22. In the rejection of claims 19-21, the Examiner cites a static, motionless, fixed field lens in Loiseaux et al. Applicants submit that the static, motionless, fixed field lens in Loiseaux et al. fails to teach or suggest the dynamic displacement element recited in claims 19-21. To further clarify the dynamic operation of the dynamic displacement element, claim 19 has been amended to recite that the dynamic displacement element dynamically moves to displace alignment of the color-component sub-pixels generated by the display panel. Applicants submit that the rejection of claims 19-21 is therefore improper and request that it be withdrawn.

In regard to claim 1,13-14 and 19, 31-32, Loiseaux et al. teach (Figs. 8 and 5b) a "a post-display panel dynamic displacement element (light directing means 44) that displaces alignment of the color-component sub-pixels 46 generated by the display panel." Applicants submit that Loiseaux et al. makes no mention of "light directing means 44." Applicants submit that this rejection is

improper for lack of support in the cited reference. Applicants request, therefore, that this rejection of claims 1,13-14 and 19, 31-32 be withdrawn.

Claims 1, 3-7,19,21-25 and 39 are rejected under 35 U.S.C.102(b) as being anticipated by Steiner et al. (US5748828A). In regard to each of the claims, Steiner et al. is cited as showing various features, including a post-display panel dynamic displacement element (light directing means 44) that displaces alignment of the color-component sub-pixels 46 generated by the display panel. Applicants respond as follows.

Claims 1, 3-7, 19, 21-25 and 39 each include "a post-display panel dynamic displacement element that displaces alignment of the color-component sub-pixels generated by the display panel." The dynamic displacement element is positioned "post-display panel" and functions to displace alignment of the color-component sub-pixels generated by the display panel.

Every word in a claim must be given its due weight and meaning. The recited displacement element is "dynamic." Dynamic means "of or relating to energy or to objects in motion." Various dynamic displacement elements are shown and described in the application, including those of Figs. 18-22. Also, "post-display panel" refers to the position of the dynamic displacement element. "Post" means "after; later, behind, or posterior to." Hence, "psot-display panel" means that the recited dynamic displacement element is positioned after or behind the display panel.

In the rejection of claims 1, 3-7, 19, 21-25 and 39, the Examiner cites a static, motionless, "light directing means," possibly a microlens array, in Steiner et al. Applicants submit that the static, motionless, fixed "light directing means" (microlens array) in Steiner et al. fails to teach or suggest the dynamic displacement element recited in claims 1, 3-7, 19, 21-25 and 39. In addition, the "light directing means" (microlens array) in Steiner et al. is positioned before or in front of the display panel (LCD module 48) of Steiner et al, not "post-display panel" as recited in the claims. Applicants submit that the rejection of claims 1, 3-7, 19, 21-25 and 39 is therefore improper and request that it be withdrawn.

Claims 8-10 and 26-28 and 33-37 are rejected under 35 U.S.C.103(a) as being unpatentable over Loiseaux et al. (US5748828A) as applied to claims 1 and 19 in view of Doany et al. (US5984478A). In regard to each of the claims, the references are cited as showing various features, including the dynamic displacement element (the polarization retardation wheel 322) includes a rotating element (wave plate segments 332a-c) Doany et al. (Fig. 3B). Applicants respond as follows.

Claims 8-10 and 26-28 each include "a post-display panel dynamic displacement element that displaces alignment of the color-component sub-pixels generated by the display panel." The dynamic displacement element is positioned "post-display panel" and functions to displace alignment of the color-component sub-pixels generated by the display panel.

Doany et al. describes the polarization retardation wheel 322 as being a dynamical polarization compensator. The polarization compensator has waveplates 322a-322c that provide fixed retardation. Retardation refers to one polarization of a light component being retard relative to another polarization component. The polarization retardation wheel 322 of Doany et al. does not displace alignment of the color-component sub-pixels generated by the display panel, as recited in the claims. Retardation is not displacement. Applicants submit that the rejection of claims 8-10 and 26-28 is therefore improper and request that it be withdrawn.

Claims 11-12 and 29-30 are rejected under 35 U.S.C.103(a) as being unpatentable over Loiseaux et al. (US5748828A) as applied to claims 1 and 19, in view of Hanano et al. (US5661603). Applicants submit that this rejection is improper for the reasons stated above and request that the rejection be withdrawn.

Applicants believe the application is in condition for allowance and respectfully request the same.

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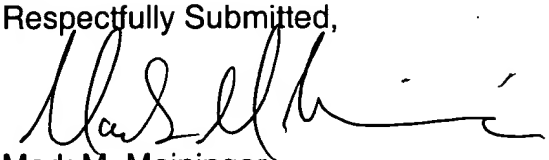
Respectfully Submitted,



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Attachment
Claims 1-39
Application Number: 09/681,184

1. A color display system, comprising:

an illumination system that provides fixed, color-separated illumination of color-component sub-pixels in a pixellated electronic display panel; and

a post-display panel dynamic displacement element that displaces alignment of the color-component sub-pixels generated by the display panel.

2. The system of claim 1 further comprising an angular color separation system with plural angularly inclined dichroic mirrors for providing the color separation of incident multi-color illumination light.

3. The system of claim 1 further comprising a microlens array positioned adjacent the pixellated electronic display.

4. The system of claim 3 further comprising a grating positioned between the microlens array and the pixellated electronic display.

5. The system of claim 4 in which the grating includes a holographic optical element.

6. The system of claim 1 further comprising a grating for providing the color separation of incident multi-color illumination light.

7. The system of claim 6 in which the grating includes a holographic optical element.

8. The system of claim 1 in which the dynamic displacement element includes a rotating element that successively directs the color-component sub-pixels generated by the display panel along different optical paths.

9. (Amended) The system of [claim 1] claim 8 in which the rotating element includes a birefringent element with a selected polarization direction.

10. (Amended) The system of [claim 1] claim 8 in which the rotating element includes a plural refractive segments having different inclination orientations.

11. (Amended) The system of claim 1 in which the post-display dynamic displacement element includes a pair of face-to-face refractive elements with a separation between them that is modified to successively direct the color-component sub-pixels generated by the display panel along different optical paths.

12. The system of claim 11 in which each of the refractive elements includes a prism array.

13. The system of claim 1 further comprising a color separating element for providing the color separation of incident multi-color illumination light and a prism array positioned after the color separating element.

14. The system of claim 13 in which the color separating element includes an angular color separation system with plural angularly inclined dichroic mirrors.

15. The system of claim 1 in which the display panel includes color-component sub-pixels that are arranged in vertical columns for each color component.

16. The system of claim 1 further comprising a microlens array positioned adjacent the display panel, wherein the each microlens is aligned with and delivers light to a triplet of color-component sub-pixels that are arranged in a horizontal row.

17. The system of claim 16 in which the display panel includes color-component sub-pixels that are arranged in vertical columns for each color component and successive sub-pixels in each column are positioned in alternate successive rows.

18. (Amended) The system of claim 1 in which the display panel includes color-component sub-pixels that are arranged in vertical columns for each color component and the system further comprises a microlens array positioned

adjacent the display panel, wherein the each microlens is aligned with and delivers light to a triplet of color-component sub-pixels [that are arranged] that are positioned among two adjacent horizontal rows.

19. (Amended) A color electronic display projector, comprising:

an illumination system that provides fixed, color-separated illumination of color-component sub-pixels in a pixellated electronic display panel; and

a post-display panel dynamic displacement element that [displaces] dynamically moves to displace alignment of the color-component sub-pixels generated by the display panel.

20. The projector of claim 19 further comprising an angular color separation system with plural angularly inclined dichroic mirrors for providing the color separation of incident multi-color illumination light.

21. The projector of claim 19 further comprising a microlens array positioned adjacent the pixellated electronic display.

22. The projector of claim 21 further comprising a grating positioned between the microlens array and the pixellated electronic display.

23. The projector of claim 22 in which the grating includes a holographic optical element.

24. The projector of claim 19 further comprising a grating for providing the color separation of incident multi-color illumination light.

25. The projector of claim 24 in which the grating includes a holographic optical element.

26. The projector of claim 19 in which the dynamic displacement element includes a rotating element that successively directs the color-component sub-pixels generated by the display panel along different optical paths.

27. (Amended) The projector of [claim 19] claim 26 in which the rotating element includes a birefringent element with a selected polarization direction.

28. (Amended) The projector of [claim 19] claim 26 in which the rotating element includes a plural refractive segments having different inclination orientations.

29. (Amended) The projector of claim 19 in which the post-display dynamic displacement element includes a pair of face-to-face refractive elements with a separation between them that is modified to successively direct the color-component sub-pixels generated by the display panel along different optical paths.

30. The projector of claim 29 in which each of the refractive elements includes a prism array.

31. The projector of claim 19 further comprising a color separating element for providing the color separation of incident multi-color illumination light and a prism array positioned after the color separating element.

32. The projector of claim 31 in which the color separating element includes an angular color separation system with plural angularly inclined dichroic mirrors.

33. (Amended) A color display method, comprising:

illuminating color-component sub-pixels in a pixellated electronic display panel with color-separated, fixed color components; and

34. (Amended) The method of claim 33 further comprising [an] angularly color separating incident multi-color illumination light to provide the color-separated, fixed color components.

35. The method of claim 33 in which dynamically aligning the color-component sub-pixels includes successively directing the color-component sub-pixels generated by the display panel along different optical paths.

36. (Amended) The method of claim 35 further comprising successively directing the color-component sub-pixels through different segments of a rotating light displacement [element] panel.

37. (Amended) The method of claim 33 in which the display panel includes color-component sub-pixels that are arranged in vertical columns for each color component and dynamically aligning the color-component sub-pixels after the display [element] panel includes displacing selected color components laterally.

38. (Amended) The method of claim 33 in which the color-component sub-pixels of a pixel are arranged on the display panel in adjacent rows and dynamically aligning the color-component sub-pixels after the display [element] panel includes displacing selected color components in transverse directions.

39. (Amended) In a color display system with plural pixellated electronic display panels that each receive illumination of a different color component of light and a combiner that combines color component light images formed by the plural pixellated electronic display panels, the improvement comprising:

a post-combiner dynamic displacement element that displaces alignment of the color-component sub-pixels generated by the [display panel] plural pixellated electronic display panels to form a resolution-enhanced display image.